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NATAL GRASS: A SOUTHERN PERENNIAL HAY CROP.

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INTRODUCTION.

Natal grass¹ is a South African plant which has been known in Florida for a long time. In recent years it has become popular on the sandy soils of the State, and to some extent along the Gulf coast westward into southern Texas. It is a perennial, but does not survive the winter where the temperature falls much below freezing. It is usually treated as an annual crop.

In the United States it is now cultivated more extensively in Florida than elsewhere. In that State estimates of its acreage in 1915 were secured from growers, from boards of trade, and through field observation by agents of the Department of Agriculture. These estimates indicate that Lake County has fully 10,000 acres, probab¹ a larger acreage than any other county, though Marion County has nearly as much. Sumter County has about 3,000 acres, and Pasco County probably an equal area. Hillsborough and De Soto Counties have over 2,000 acres each, and many other counties have smaller areas. The acreage is being extended very rapidly in many sections of the State where the soil is suited to its growth. Farther west

¹ *Tricholaena rosea* Nees.

along the Gulf coast Natal grass succeeds well, but has not yet been extensively planted. The accompanying map (fig. 1) shows the regions in the United States where this grass has been found of great value and other regions where it should be more thoroughly tested. It is grown very extensively in Australia, and it is from that country that most of the seed has been imported.

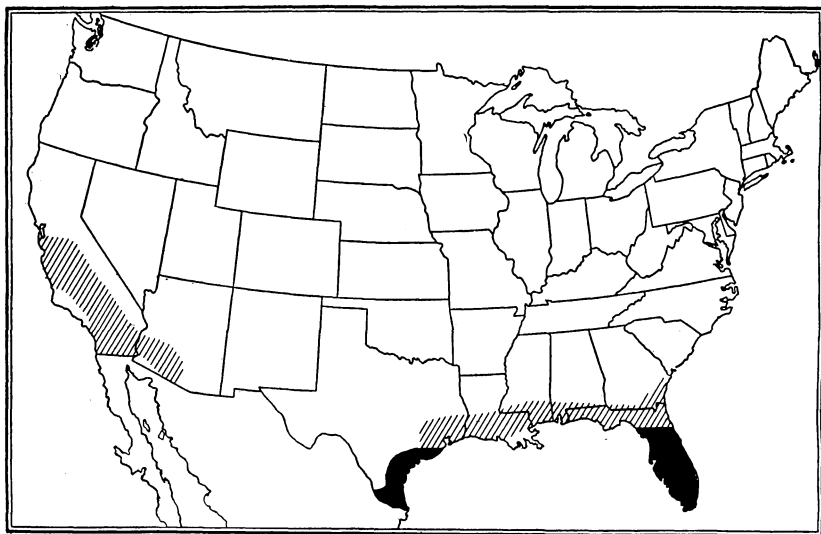


FIG. 1.—Outline map of the United States, indicating the regions to which Natal grass is adapted. The black areas show where it succeeds best and the shaded areas where it should be tested.

While it can be grown as a summer annual as far north as Washington, D. C., it is not likely to become of much importance as a field crop except in the extreme South.

DESCRIPTION OF NATAL GRASS.

When a single plant of Natal grass is allowed abundant room it will form a large tuft, sometimes 3 to 4 feet in diameter. The lower branches soon become decumbent, while the central stems are more nearly erect. When planted closely, however, the tufts are much smaller, often making only a few stems, and those nearly erect. The stems are slender, 3 to 4 feet high, and well covered with leaves, which are so nearly erect that few are lost in mowing the hay.

The seeds are produced in large clusters of about the size and shape of a panicle of oats, as shown in figure 2. In most cases the seed clusters are bright red or rosy crimson in color, and for that reason the grass has sometimes been called redtop, Australian redtop, and Hawaiian redtop. It is, however, very different from the common northern grass known as redtop. For this reason the name Natal grass, which indicates the country of which it is a native, is

more appropriate and distinctive and is the one now in most common use.

The root system is unusually strong, the roots being numerous and penetrating very deeply into the soil, so that they reach permanent moisture in the subsoil and enable the plants to make a continuous growth even in very dry weather. These roots are very slender and decay quickly, so that they do not interfere with the planting of other crops immediately after the ground has been plowed.

While the grass is very persistent with annual plowings, and fairly so without plowing, it never becomes a troublesome weed. The plants are killed by a single plowing, and by keeping the land cultivated in other crops through the whole of a single season all the seeds in the ground will have germinated and the young plants will be killed by the cultivation.

Natal grass can be cultivated profitably only when used for the production of hay or of seed or both. Its greatest value is for making hay, for which it is the best grass yet found for the well-drained sandy soils in Florida. The stems and leaves are very slender and cure into hay easily and quickly. The seed now finds a ready market at a fair price.

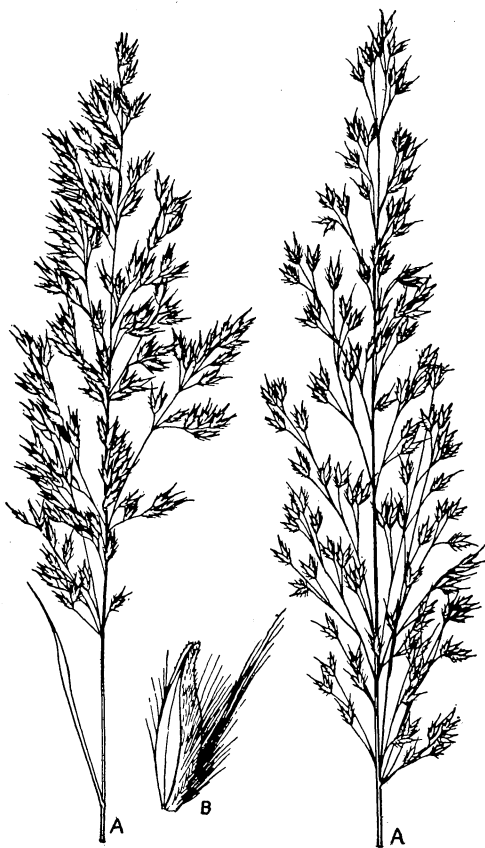


FIG. 2.—Seed heads of Natal grass (A, A) and a seed (B) (greatly enlarged).

HISTORY AND INTRODUCTION INTO THE UNITED STATES.

Natal grass was first described by Nees in 1835,¹ from specimens collected in South Africa. Its attractive appearance led to its be-

¹ Nees von Esenbeck, C. G. D. *Annotationes botanicae ex Indice seminum hort. bot. Vratislaviensis, anno 1835.* In *Ann. Sci. Nat. Bot.*, s. 2, t. 6, p. 105. August, 1836. Original not available.

The description is given also in *Linnaea*, Bd. 11, Lit. Ber., p. 129, 1837; also in Nees von Esenbeck, C. G. D., *Florae Africae Australioris* . . . I. Gramineae, p. 17. Glogaviae, 1841.

ing cultivated as an ornamental plant, and it was grown in the United States for that purpose as early as 1866, as is shown by specimens still preserved in the National Herbarium. It was grown as a forage plant in the trial gardens of the Department of Agriculture in 1878. A recent letter from T. A. Carroll, now of Jacksonville, Fla., states that he found it growing on a trash pile at Reddick, Fla., in 1875, and by 1894 it was abundant in that region. In 1884 seed was sent by a naval officer from Brazil to an orange grower near Altamonte Springs, Fla., and by 1890 it had spread a few miles in all directions from there. In 1891 it was received by the Department of Agriculture from Natal, South Africa, and from Queensland, Australia; in 1892 it was secured from India, and in 1894 from the Hawaiian Islands. In 1892 it was grown at the Florida Agricultural Experiment Station, then located at Lake City, from seed grown from that which the Department of Agriculture had received the previous year, and it soon spread in several parts of Florida. In 1906 the Department of Agriculture obtained a large quantity of seed from Reddick, Fla., and distributed it during the following year. At that time the grass was very abundant there over an area of perhaps 15 miles in length and 6 to 8 miles in width. Several persons who had lived there many years stated that it had become well established as early as 1884. At the time this seed was gathered a considerable area of the grass was being cut for hay for local use. Within the last five years the cultivation of the grass for hay has become very extensive, especially in the central part of the State of Florida.

CLIMATIC ADAPTATIONS.

Natal grass requires a long and warm season for its growth. Being a perennial, it grows continuously until checked by cold weather, so the longer the warm season the greater will be its period of growth. It is not injured by moderately cool weather, but its growth is always stopped by the first frost, and nearly all the plants are killed by even a slight freezing of the ground. Heavy freezing when the ground is damp not only kills the plants, but it also kills many of the scattered seeds and so prevents the reseedling of the ground. The cultivation of this grass is not recommended where heavy winter freezes occur, or even where light freezes are frequent.

Natal grass makes its principal growth in middle and late summer, and most of that now cultivated in Florida is grown in rotation with some winter or early-spring crop.

SOIL PREFERENCES.

Natal grass is like any other plant in that it makes its best growth on the richest soil. Fertilizers are seldom used directly on the grass.

They are not needed for making a good crop on land which has been newly cleared, as such soil always produces a heavy yield. Older fields are usually well fertilized in the fall for the growing of some winter crop, and the residue of that fertilizer is sufficient to make a good growth of the grass during the following seasons. When any special fertilizer is used on the grass it should be largely nitrogenous, cottonseed meal or nitrate of soda being the materials most commonly used.

The best soil for the grass is one which is sandy and well drained. On such soils it makes a better growth than any other grass and re-seeds itself freely. Excellent crops of Natal grass have been grown on muck soils in various sections of Florida, but it is doubtful whether it will be as profitable there for either hay or grazing as grasses which make a heavier growth, like Para grass and Rhodes grass.

While Natal grass grows well on clayey soils, there is yet little experience to show whether it will reseed the ground as thoroughly on such soils as on those which are more sandy.

PREPARATION OF THE SEED BED.

No special preparation of the ground is necessary before sowing the seed except that the surface should be made as fine, mellow, and even as possible, as for seeds of all hay grasses. The field should be made so smooth that a mowing machine can be used without trouble. It costs far more to run a mowing machine over a field which is rough and uneven than it does to harrow the same field until all bumps are leveled and all holes filled.

If the soil is heavy or cloddy the harrowing should be much more thorough than where it is light and sandy. If the field has been used for some crop which was grown in rows it should be disked and harrowed until no trace of the rows can be seen. All stumps should be removed, not only for the sake of securing additional ground on which the grass may grow, but also to avoid injuries to the mowing machine and other implements used in harvesting the crop. It pays well to put the ground in the best possible condition before the seed is sown.

TIME OF SEEDING.

In central and southern Florida seeding may be done at any time during the year, though spring is the favorite season and the only season in which it should be done farther north. In southern Florida many growers prefer to sow in September or October. Sown at that time the seeds germinate quickly and the young plants go through the winter with little or no loss and give a much earlier cutting of hay than plants from seed sown in the spring.

When the ground is not occupied by a winter crop it may be plowed or disked in late winter or early spring, fertilized if necessary, and the seed sown. Such seeding will give a good cutting of hay in May or June, and two or three cuttings later in the season.

METHODS AND RATE OF SEEDING.

The seed is always broadcasted, as it will not feed through a drill evenly. The seeds are very hairy and usually stick together in large bunches when dry, so it is well to dampen and roll them in soil or wood ashes before sowing. When treated in this way they remain separate and it is much easier to secure an even distribution over the ground. After sowing, a plank dragging or a rolling is all that is necessary to cover the seeds. Many planters think it better to leave the covering wholly to the rains. The seed should never be covered deeply, and therefore it is important that the surface of the ground be made fine and smooth before the seed is sown.

In sections where the grass is abundant it spreads naturally to cultivated fields, the seeds being carried by the wind, the feet of animals, farm implements, and in other ways. When a field is once covered by a good stand of the grass, no attention need be given to subsequent seeding, as the grass will volunteer each year.

The quantity of seed to be used will vary with its quality, with the season when sown, and the time when a full crop of hay is expected. When the seed is of good quality and the sowing is done in early spring while the ground is still occupied with oats, potatoes, or some other winter crop and no hay crop is expected until late summer, the seeding may be very light, only 2 or 3 pounds per acre. If not done until later in the season it should be much heavier, 8 to 10 pounds per acre, so as to secure a full stand as soon as possible.

When the ground is occupied by some other crop in the spring, it is a frequent practice to set out young plants, placing them 8 to 10 feet apart, instead of using seed. Such plants ripen a crop of seed earlier than those from seeds planted at the same time and so give the ground a full reseeding earlier. Setting plants is more troublesome and expensive than the planting of seed and is not recommended except where a full crop of hay is desired as promptly as possible after removing the other crop. The few plants needed can always be set so that they will not interfere with the growing crop. They cost only the labor of planting, and their use hastens the securing of a full stand.

ROTATION AND MANAGEMENT.

A common practice in growing Natal grass is to plow the ground after the last cutting has been made in the fall and then plant the land to oats or some winter truck crop. After the winter crop is

removed in the spring, the land is given a shallow plowing or disking and is harrowed until smooth. When treated in this way no reseeding is necessary, as the fall plowing buries the scattered seed in the ground, where it remains in good condition through the winter, while the spring plowing or disking brings it back near the surface, where it germinates quickly. On fields treated in this way the first cutting for hay can be made about two months after the spring disking, and later cuttings from six to eight weeks apart. If the land be plowed deep in the fall and not replowed in the spring, most of the seeds will be so deep in the ground that they can not germinate, and the stand of grass will be thin and uneven.

When a truck crop, like melons, is not planted until early spring the grass crops will be later in maturing. Where such truck crops are grown, a little care in cultivation will leave the ground sufficiently smooth for the use of a mowing machine, and the first cutting for hay can be secured about two months after the last cultivation. In this case, the several cultivations of the truck crop bring sufficient seed near the surface of the ground to insure a good stand of the grass.

Where the ground is well set with the grass and it is not plowed in the fall, it will give a cutting in the spring much earlier than when plowed in fall and spring, and usually four or five cuttings may be secured during the season, though the total yield for the year will be about the same as when plowed. After the second or third year without plowing, other grasses and weeds begin to come in, making the quality of the hay inferior and decreasing the yield. One objection to leaving the ground without plowing in the fall is that in the spring the plants start into growth very unevenly, so that by the time there is enough of the grass to pay for cutting, some of the stems will be old and dry, while others will be only partly grown. When plowed in the fall and disked in the spring the plants start much more evenly and the first cutting is of a decidedly better quality, as is shown in figure 3.

It has not been found advisable to sow Natal grass with cowpeas, beggarweed, or any other forage crop yet tested for the purpose, as they do not mature at the same time. Whatever other crop has been used for mixing with Natal grass, its growth has been so small before the Natal grass is ready for cutting that there is little or no increase in the total yield of the crop and no improvement in the quality of the hay.

When a suitable field has once been seeded it will continue to produce the grass for many years, and perhaps indefinitely, if the land is cultivated occasionally, so as to kill out broom sedge and other weedy grasses and to break up the crust.

HARVESTING THE HAY.

The mowing of Natal grass should begin as soon as a considerable part of the seed begins to ripen. If the weather should be unfavorable at that time it can stand several days without great injury, as it is making a continuous growth of new shoots. When the cutting is delayed too long the quality of the hay is injured by the shattering of the seeds and by the drying up and breaking off of the older stems. The greatest loss from delaying the cuttings too long is the consequent postponement of the subsequent cuttings. To secure the greatest yield during the year and to make hay of the highest quality, all of the earlier cuttings should be made as soon as the grass is in proper condition, though the last cutting may be delayed until a few days before frost is expected, as the grass is growing



FIG. 3.—A field of Natal grass in Florida.

rapidly at that time and the late cutting insures a good supply of seed on the ground for the following spring.

The grass dries so quickly that it should be allowed to lie on the ground only a short time. Unnecessarily long exposure bleaches the hay and makes it less palatable, less nutritious, and less salable. The best hay is that which is cured in the shortest time and with the least exposure to the weather. Exposure to rain bleaches and injures the hay seriously, and even exposure to heavy dews deadens the color and makes the hay less attractive in appearance. One can usually be reasonably sure of the weather several hours in advance and choose a time for cutting when the hay can at least be cured sufficiently to put it in the cock before it is wet by rain or dew.

When the weather is favorable for curing, it is best to mow in the morning, from the time the dew is off until noon, and then windrow and cock in the afternoon. The hay should remain in the cock until thoroughly field cured. The time required for this field curing will depend on the condition of the weather. If very favorable it may be safe to haul it to the barn after it has been in the cocks 36 to 48 hours, but a longer time is often necessary.

Field curing may be regarded as completed when the stems are so dry that they will break when a small wisp of the hay is twisted tightly, when it does not feel cool if pressed to the cheek, and when stirring it slightly produces a dry rustle.

When conditions are unfavorable for drying, as in rainy, cool, or cloudy weather, the field curing requires a much longer time and is often unsatisfactory.

With all the judgment which the grower may use, some hay will occasionally be caught by rain, and it then requires special care to cure it thoroughly. If it rains on the hay soon after it is cut little harm will be done, but the injury will be greater if the rain comes after it is partially dry. If the dry or even partly dry hay be wet with rain, it should not be touched until the surface has become thoroughly dry. If it is still in the swath it will need no attention unless the crop is very heavy, when it should be tedded or turned with a fork. If in the windrow or cock it should be opened and spread as soon as the outside has become well dried.

Much field injury from rain may be prevented by the use of hay caps for covering the cocks. These caps are made in various styles, but the one most generally liked is a piece of heavy cotton cloth 4 to 5 feet square, with a pin of heavy wire a foot in length fastened to each corner. When the cap is put in place and the pins are pushed into the cock to prevent it from being blown off, the hay will stand a heavy rain with very little injury. The hay should not be put into the barn or the stack until it is so dry that there will be no danger from heating and molding, and when the weather is not very warm and dry it is not safe to bale it until at least a week after it is cut. In case it must be taken to the barn while still slightly damp, a dressing of salt, about 5 pounds per ton, or a light sprinkling of freshly slaked lime will aid in its preservation.

The field curing should be as thorough as the weather will permit, after which the hay should be hauled to the barn and the final curing completed there.

At present a large part of the Natal grass hay is put in stacks when hauled from the field. In many cases this can not be avoided, but with the frequent and heavy rains which occur in Florida it is much safer to store it in a barn or under a shed. When stacked, there

is always considerable loss from leaching and bleaching on the outside of the stack, a loss which may be almost wholly prevented when the hay is protected from the weather. The sweating and final curing are much more even when completed in a mow, and so a better quality of hay is secured than is possible from an exposed stack.¹

The hay should remain in the mow until it goes through a sweat, as this develops a sweeter aroma in the hay and makes it safe from heating and molding in the bale. The degree of heat developed in this sweating will depend very largely on the amount of moisture in the hay. If the hay is put in the mow before it is well air cured, the heat may be excessive and the hay discolored. If it is only moderately browned its actual feeding value is injured very little, though the hay is less readily salable.

In humid regions like Florida it is never safe to bale hay direct from the field or within a day or two after cutting, as is sometimes done in the dry climate of the West. If hay be baled before it has gone through the sweating process, it is always liable to sweat in the bale and perhaps become moldy and worthless.

While it may appear dry and well cured there is almost sure to be moisture left in some of the stems, especially in the joints. This moisture is often sufficient to cause heating in the bale, and when the hay reaches the market it will be found so damaged as to be classed as of very low grade.

Natal grass hay is of such recent introduction that it has not yet secured a standing in the general markets. With proper care in curing and handling it will probably rank with any other good hay in popular favor and bring an equal price on the market; but the hay can never establish its proper reputation unless great care is taken that none is offered except that which is bright in color and well cured. No hay which is not strictly of high quality should ever be placed on the outside market. If it is off color or inferior in any way it should not be shipped, but kept for home use and the local market.

YIELD OF HAY.

The average yield of Natal grass hay is 2½ to 3 tons per acre, or about three-fourths of a ton for each cutting. Double those quantities are sometimes secured where conditions are unusually favorable. When the ground is plowed in the fall and disked in the spring, three mowings are usually secured; while if not plowed or disked, four or five mowings are made, though the total yield in both cases is about the same.

¹ For further details in regard to the drying and curing of hay, see Piper, C. V., McClure, H. B., and Carrier, Lyman, "Growing hay in the South for market," U. S. Dept. Agr. Farmers' Bull. 677, 22 p., 10 fig. 1915.

A report of the Florida Agricultural Experiment Station¹ says, in writing of this grass:

The seed was sown in drills one foot apart on May 1 and 2, 1908. Soil and weather conditions were favorable at this time, and a good stand was obtained. Ninety days after planting the crop was ready to be cut for hay; but since it was our desire to obtain as much seed as possible, it was not cut until the seed was ripe. A good crop of seed was gathered by hand from August 10 to 15. The grass was cut for hay on August 18, and gave a yield of 3,833 pounds of field-cured hay per acre. About November 10 a second crop of seed was gathered, and a second crop of hay was cut November 19, giving a yield of 1,417 pounds of field-cured hay per acre. The total yield for the season was 5,250 pounds per acre, or 2.6 tons. Natal grass is without doubt a most promising crop for Florida farmers. With favorable soil and moisture conditions it is believed that a yield of three or four tons per acre can be expected.

It should be noted that the results reported above were secured at Gainesville, Fla., which is somewhat north of the best Natal grass region, and that the main object in growing the grass was to secure seed. Allowing it to mature two good crops of seed undoubtedly decreased the yield of hay very materially.

QUALITY OF THE HAY.

Good Natal grass hay is an excellent feed. The stems and leaves are not tough, are very palatable, and are eaten without waste. The stems are so slender that the hay makes an attractive-looking bale and so sells well on the market. The commercial use of the hay has been developed in the last few years, and wherever offered it usually brings the same price as timothy, though in the Tampa market it sells even higher. For many years timothy has been the standard of excellence for a market hay, and any hay which can compete with it successfully must have many desirable qualities. Natal hay is easily cured, is richer in protein than timothy, sells well on the market, is eaten well by stock, and therefore is able to compete with timothy in all regions where it can be grown.

It is a well-established fact that when a grass is cut while young it contains a higher proportion of protein, the most desirable element in a food, than the same grass cut after it becomes older.

Natal grass makes a constant growth, continuing to develop new stems through the entire season, so that each cutting contains a very considerable proportion of young shoots with the more mature stems. Grasses which give only a single annual cutting usually mature evenly and are not cut until most of the stems and leaves are fairly well matured; consequently, they contain a smaller proportion of protein than they would if cut when only partly grown and therefore they have a smaller feeding value.

¹ Scott, J. M. Report of animal industrialist. In Fla. Agr. Exp. Sta. Rpt. [1908]/09, p. XIX-XX. [1909.]

Table I gives the chemical analysis of Natal grass hay, based on that reported by the Florida Department of Agriculture,¹ but reduced to a water-free basis to compare with the timothy analysis, and also the average analysis of 272 samples of timothy hay, as compiled by Mr. G. L. Bidwell, of the Department of Agriculture.

TABLE I.—*Chemical analyses of Natal grass hay and timothy hay.*

Constituents (dry material).	Natal grass hay.	Timothy hay.
	<i>Per cent.</i>	<i>Per cent.</i>
Fiber.....	40.72	32.86
Ash.....	5.56	5.82
Protein.....	8.25	7.87
Nitrogen-free extract.....	43.47	50.40
Ether extract.....	1.99	3.05

The palatability of the hay is something which can not be measured, but cattle and horses seem to prefer Natal grass hay to most other kinds.

A hay which is easily cured, which is rich in protein, which sells well on the market, and which is eaten well by animals is good hay.

VALUE AS A SMOTHER CROP.

When planted on a favorable soil Natal grass makes such a vigorous growth as to choke out most other grasses and weeds. Sand spurs of several kinds are frequently a great pest on sandy soils, though where abundant they are sometimes cut for hay, making a crop of light yield and inferior quality. Sand spurs almost wholly disappear when the land is seeded to Natal grass, so that many fruit growers and truckers claim that it is worth more than it costs for that purpose alone. Sand spurs are especially troublesome in citrus groves, often being so abundant as to make work in them extremely disagreeable. The growing of Natal grass in the groves not only prevents the growth of the sand spurs, but it also gives two or three crops of excellent hay annually. Citrus groves need thorough cultivation in the spring, to stimulate them into a vigorous growth in early summer, and little cultivation in late summer, so as to reduce them to a dormant condition for the winter. The growing of Natal grass between the rows of trees accomplishes both these results very satisfactorily. The grove may be cultivated thoroughly during the early spring months, when cultivation is most needed, and in late summer, when cultivation should cease, the Natal grass takes possession of the ground, prevents the growth of sand spurs and weeds, checks the growth of the trees, and gives one or two cuttings of hay,

¹ Fla. Dept. Agr. Quart. Bul., v. 18, no. 1, p. 96, 1908; Fla. Agr. Exp. Sta. Rpt. [1908]/09, p. xix [1910]; Fla. Agr. Exp. Sta. Press Bul. 208, 1913.

which are so much additional profit in the cultivation of the grove. A grove treated in this manner is shown in figure 4.

SAVING SEED.

When new fields are to be sown with Natal grass it is sometimes difficult to secure seed which will germinate well. Good seed should show 80 to 90 per cent of germination, but many samples show less than 10 per cent. This low germination of some samples is due wholly to faulty methods of gathering and handling, as well-ripened, fresh seed which has been properly cured always germinates well. The more common custom of gathering the seed is to have cheap labor—mostly negroes and children—gather the seed by hand, the usual payment for the work being at the rate of about 10 cents a



FIG. 4.—Natal grass in an orange grove.

pound. Of course, the workers want to gather as many pounds as is possible in the course of the day. The ripe and the immature seed heads look very much alike, except that the ripe heads are paler in color and appear a trifle more woolly. An expert who examines the grass will see the difference at once, but the laborers usually employed for the gathering are seldom discriminating and strip the head nearest to the hand, regardless of its condition. The immature heads are more compact and more easily stripped than are those which are mature. For these reasons, a large proportion of the seed gathered by such laborers is so immature as to be nearly worthless. Seed should never be gathered until the deep-crimson color of the immature heads begins to fade to the paler red of those which are ripe and until the glossy appearance of the immature heads is obscured by the spreading hairs of those which are really ripe.

Attempts have been made to gather the seed by machinery, using a machine similar to a suction sweeper. This gathers only the ripe seeds, which separate from the heads more easily than those which are unripe. Where the crop is fairly well matured, this machine, with one man and one horse, will gather about 10 pounds of seed per hour; but this cuts down the value of the hay crop nearly half, as the grass must be overripe for hay before the seed is ripe enough to be gathered.

Where the grass has made a good growth, the yield of seed is about 100 pounds per acre from the first growth, which can be stripped with little injury to the hay. It is claimed that a ton of seed per acre can be gathered if the crop is allowed to grow through the whole summer without being cut.

When immature seeds are gathered, they are full of moisture and heat very quickly unless spread out to dry. This heating kills many of the good seeds which may have been gathered with those which are immature. When mature seeds are gathered early in the morning while still damp with dew, they will heat and soon be killed. A closely packed sack of seed which has been gathered on one day is almost sure to become so heated as to be nearly worthless the next morning. When freshly gathered seeds, even those which are fairly mature, are left in a closely packed sack for two days, very few of them will germinate.

Good seed can be saved in Florida if it is carefully selected in the gathering and then dried properly. The freshly gathered sacks of seed should be emptied at noon and at night, or whenever brought to the barn, and the seed spread on the floor so it will not be more than a foot deep.

Prompt and thorough drying is essential to preserve the seed in good condition. After it is emptied from the sacks it should be stirred frequently, at least twice daily, until it is well air dried, after which it may be again put in sacks for storage. If the weather is very warm and dry, the seed may be dried in two or three days, but if cloudy and cool the drying may require a much longer time. The smaller the bulk of the seed and the more frequently it is stirred, the more quickly it will dry. If only ripe seed is gathered and it is thoroughly dried out at once, it may be kept in good condition for some years if stored in a thoroughly dry place. The seed is very light, weighing only 7 pounds per bushel when well packed.

A large quantity of this seed has been imported from Australia, as seed from that country has generally given a high germination, while the Florida seed has usually been found to have a low germination. This has given many growers a strong and probably justifiable prejudice in favor of the imported seed. Up to the present time the larger portion of the Florida-grown seed has been of poor

quality, but there are a few growers who save seed of a higher viability than has been shown by imported seed which the Department of Agriculture has tested. Florida can produce as good seed as can be obtained anywhere, provided the growers will use proper care and intelligence in its gathering and curing. Ordinary Florida-grown seed is often sold for 25 to 50 cents a pound, while the imported seed usually costs about a dollar. Florida growers who save seed which is really better than the imported say that they can not afford to sell it for less than \$1 per pound. In this case, as in most others, the low-priced seeds are really the most expensive. Poor seeds are expensive at any price. The chief essential in producing good Natal grass seed in Florida is intelligent gathering and handling.

TESTING THE SEED.

The quality of the seed is so variable that it should be tested before planting. This testing may be done by scattering a few seeds between pieces of damp blotting paper and retaining them in a warm room a few days, keeping the blotting paper constantly damp, but not wet. A still better method is to plant a few rows of seed in a box of soil, as tomato and cabbage plants are often grown. This testing should be begun at least a month before the seed is to be sown. If the seed proves to be good, from 3 to 10 pounds per acre should be used, while if it germinates poorly a correspondingly larger quantity should be sown.

VARIETIES.

There are several varieties of Natal grass, which are as distinct as are varieties of oats or corn. Some of these varieties show differences in color of seed, which varies from dark red to light pink, pinkish yellow, or nearly white; some have leaves of a bright-green color, while others have leaves which are almost blue and quite glaucous; some are killed by light frosts, while others live through moderately severe winters; some are nearly erect in growth, while in others the earlier stems soon become very decumbent and take root at the joints where the stems rest on the ground; in some, the leaves are very narrow, slender, and erect, while in others they are much broader and somewhat drooping.

Several varieties from Brazil and elsewhere are of such recent introduction that it is still impossible to say which may be of the greatest general value or which may have special value for special locations. All of these varieties, together with several others, are now being tested under ordinary field conditions in the expectation that distinct standard varieties will be developed in the near future.

It is quite possible that a mixture of varieties may prove more prolific than any one sort when grown alone. This, however, can be determined only by further field tests.

PASTURES.

Natal grass makes good grazing for cattle and horses during late summer and fall; but other pasturage is abundant at that time and can usually be had at less expense. Natal grass gives little grazing in winter and early spring. It does not grow well on ground which has never been plowed, and as the land on which it is grown should be plowed at least once every two years, it can not be recommended as a foundation for permanent pastures.

There are few permanent pastures in Florida except the native range in the pine woods, and as Natal grass makes a good growth only on soils which have recently been in cultivation it has little value as an addition to such permanent pastures as now exist.

It is not suited for use on the lawn, as it grows tall and does not make a turf.

SUMMARY.

(1) Natal grass is a subtropical grass which is valuable for cultivation in the United States only in the extreme South.

(2) Natal grass is the most valuable hay grass yet found for the sandy soils of Florida, and it will probably prove of value in southern Texas, and perhaps farther west in Arizona and California.

(3) Natal grass is best adapted for growth on well-drained sandy soils and apparently does not reseed itself freely on heavy soils.

(4) Natal grass is well suited for use as a summer crop, to follow such winter crops as oats or vegetables.

(5) When sandy land is once seeded Natal grass does not need re-seeding if the land is plowed in the fall, a winter crop grown, and the land again plowed or disked in the spring.

(6) If the land on which Natal grass is grown is not used for a winter crop and not plowed, it will give not only a cutting earlier in the spring, but a greater number of cuttings during the season, though the total yield of hay will be about the same as if a winter crop had been grown.

(7) This grass is not desirable for lawns and is of only moderate value for pastures.

(8) The hay is of excellent quality, being easily cured, richer in protein than timothy, attractive in appearance, and very palatable.

(9) Natal grass seed of high quality can be grown in Florida, but care and intelligence must be used in its gathering and handling.